The Anatomy of *Coluber radiatus* and *Coluber melanurus*

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Coluber radiatus is a well-known snake in Java. However, we found only 43 of these in a total of nearly 6,000 snakes collected over a number of years before and after World War II in the north coast of Java. Looking at the small number of *Coluber radiatus* in our catches, one may get the impression that it may be much less common than was generally thought.

The name *radiatus* is explained by Schlegel (1837: 135) as referring to the very typical black stripes on the head and on the sides of the body:

L'occiput est marqué d'une raie transversale noire et un peu en croissant, à laquelle se joignent de chaque côté une raie plus étroite provenant de l'oeil: deux autres, naissant également sur les bords de cet organe descendent sur les lèvres. Le dos est orné de deux larges raies noires longitudinales; une autre plus étroite règne le long des flancs....

The popular name in Java is "ular tikus," meaning the snake (that hunts the) rats, and it is a very apt name, as this snake is indeed a predator on rats and mice and as such is a very useful animal. It is incredibly swift in its movements: we had a *C. radiatus* in a rather small cage, about 100 cm. long and 80 cm. wide and deep, and a rat was put into it. For the first minutes nothing happened, but all of a sudden the snake moved and, in a matter of a few seconds, it caught the rat in a coil, crushing it to death. The whole attack happened so quickly that it was difficult to follow the series of movements involved. This snake is not poisonous and is in no way harmful to man, but it is aggressive, it strikes and bites easily. Sometimes it takes a remarkable attitude more of defense than of attack, as is described by van Heurn (1929), who gives the following details: the first third of the body is bent in a U that points laterally, the head is directed forward towards the enemy, the mouth is wide open. The neck is compressed laterally, contrary to the manner of cobras. The author illustrates his article with a clear drawing.

MATERIALS AND METHODS: Our material consists of 43 snakes, 28 from Surabaia (8 females, 20 males), and 15 from Djakarta (5 females, 9 males, one new-born animal that has not been sexed). Kopstein (1941) measured the length of the body and that of the tail in 15 females and 16 males. In our series we took each animal that was offered, without attempting a selection. The snakes were killed by occipital puncture, weighed, perfused through the aorta with saline followed by Bouins liquid for hardening, and then the distances from the snout to the top and to the end of each organ were measured. For statistical analysis the work of Simpson and Roe (1939) has been followed.

PATHOLOGY: Infestation with round worms was fairly common. Two males (body length 1249 and 1252 mm.) were wounded, the first one at about one-third of its length behind the head, the other one close behind the head.

BLOOD: The blood of a female (body length 1156 mm.) was analysed in the laboratory of Prof. Radsma. The following results were obtained: Na 509, K 18.8, Ca 17.2, where the figures represent the number of mgs. per 100 ml. of plasma.

SIZE: The maximum lengths observed by various authors are summarized, together with our data, in Table 1.

In our material combined with the data gathered by Kopstein, the female group includes six very young animals, hardly more than new-born ones, as against a single very small one in the male group. To make both groups more comparable, the five shortest females are not included in the data used for Figure 1.

For our reasoning it does not make much difference whether we include them or leave

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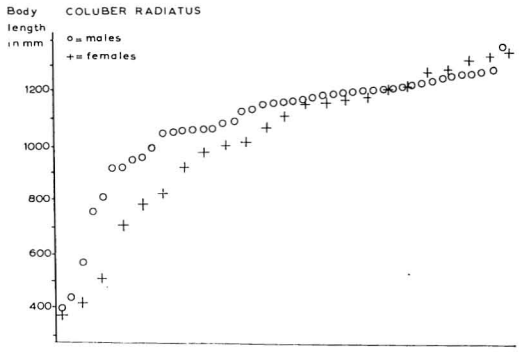

FIG. 1. Body lengths, male and female specimens.

them out, because, in any event, the point of intersection between the first steep part of the curve and the plateau is to be found at a length of about 950 mm. The curve does not suggest a sexual dimorphism in body length.

SEX RATIO: It is always a difficult question whether the findings on a small group can be used in a more general way. In the case of the sex ratio in *C. radiatus,* there are three independent observations, each one on a small group, but all pointing in the same direction. In Table 2 the figures of Kopstein (1938) and those of our material from Surabaia and Djakarta are shown.

These figures are very suggestive of a sex ratio of two males to one female. However, in 1941 Kopstein published a list of measurements on 16 males and 15 females, those of 1938 included. This may signify that a few years more of collecting can change the first impression. On the other hand Kopstein, when collecting, has not included in his method the factor of not-selecting as a *conditio sine qua non,* and it seems probable that his first figure is more the result of a random sample than the second one. But even when we take Kopstein's later figures, there is a greater number of males, still in the order of two males to one female.

TABLE 1

Coluber radiatus, LENGTH OF BODY AND OF TAIL

AUTHOR	MALES		FEMALES		SEX UNKNOWN	
	Body	Tail	Body	Tail	Body	Tail
de Rooy					1280	330
Smith	1520	370	1445	350		
Kopstein	1267	(293)*	1218	(308)		
Bergman	1380	(311)	1352	308		

* The figures for the length of the tail in parentheses do not refer to the animal whose body length is given.

TABLE 2

Coluber radiatus, SEX RATIO

AUTHOR	MALES	FEMALES	TOTAL
Kopstein 1938	9	6	15
Bergman Surabaia	9	5	14
Bergman Djakarta	20	8	28
Totals	38	19	57

MATURITY: In our small series, the shortest female carrying growing eggs (which are 6 mm. in length) has a body length of 1006 mm. As we saw in the curve of successive body lengths (Fig. 1), the intersection of the ascent and the plateau is at about 950 mm. body length. We will not be very far from the real value when we take this figure as the lower limit of the adult size for both sexes.

BODY LENGTH: When all animals are taken together, the average figure for the length of the body is 1096 mm. in males, 898 mm. in females. However, we have already noted that there is an excess of five new-born animals in the female group, which, in a total of 28 animals, makes the average figure too low. If these five females are removed from the series, the average length for the females would be 1018 mm. Taking the adults alone (in this case the animals with a body length longer than 950 mm.), the average length for 38 males is close to 1170 mm., and for 16 females is 1178 mm., which is practically the same figure. It can be

TABLE 3

Coluber radiatus, MUTILATION OF THE TAIL

	TAIL		
	Whole	Mutilated	Totals
Males	35	10	45
Females	24	4	28
Total	59	14	73

TABLE 3*a*

Coluber radiatus, MUTILATION OF THE TAIL

	WHOLE	MUTILATED	TOTALS
Young	17	2	19
Adult	42	12	54
Total	59	14	73

concluded, therefore, that there is no suggestion of sexual dimorphism in body length.

TAIL: For a fighting species the number of broken tails does not seem excessively high: 14 in a total of 73. The figures for both sexes are given in Table 3. One might ask whether the males show more mutilated tails than do the females, or whether it is the other way round, or perhaps whether there is no difference at all.

For the data shown here, χ^2 is very small, and the deviation from the hypothesis of independency is very probably due to chance. In other words, there is no association between frequency of mutilation and sex.

If we should take the young animals of both sexes together and, similarly, the older ones of both sexes, and divide these into groups of mutilated and of nonmutilated individuals, then Table 3*a* will show these new figures. $\chi^2 = 1.24$, and it is not possible to see here an association between the length of life and the number of casualties.

The length of the tail and the body for nonmutilated animals is given in Table 4, and the illustration in Figure 2.

In both sexes the relative length of the tail

TABLE 4

Coluber radiatus, LENGTH OF BODY AND OF TAIL

	AVERAGE LENGTH OF THE:			
	N	Body	Tail	Tail length in ‰ of body length
Males, juv.	6	658	165	250
adult	28	1155	288	252
Female, juv.	6	640	153	239
adult	13	1170	281	240

TABLE 5

Coluber radiatus, THE LENGTH OF THE TAIL IN ‰ OF THE BODY LENGTH

	N	R	$M \pm \sigma n$	$\sigma \pm \sigma\sigma$	$V \pm \sigma v$
Males	28	230–286	251.3 ± 2.3	12.3 ± 1.6	4.9 ± 0.7
Females	13	222–268	240.0 ± 3.4	12.2 ± 2.4	5.1 ± 1.0

is the same in both the group of young and that of the adult animals.

Between the sexes there is a difference which is small but which may well be real: D/σ_D is 2.76. The hypothesis that there is a sexual dimorphism in the length of the tail seems more probable than the alternative.

FERTILITY: Kopstein (1941) reports the observation of van Heurn, who saw 8 eggs in one nest, and adds an observation of his own upon a nest with 10 eggs. Smith (1943) mentions from 5 to 12 eggs laid at a time. In our material, four animals carried mature eggs in the uterus or in the ovaries. The figures are summarized in Table 6.

The average number of eggs per female is about 7, with 5 of them on the right side and 2 on the left.

TOPOGRAPHY: Data on the topographical pattern of the organs are available for 27 male adult animals with an average body length of 1196 mm., and for 9 adult females with an average body length of 1200 mm.

In this case it is already apparent from the average figures that all of the organs are situated more cranially in the female than in the males,

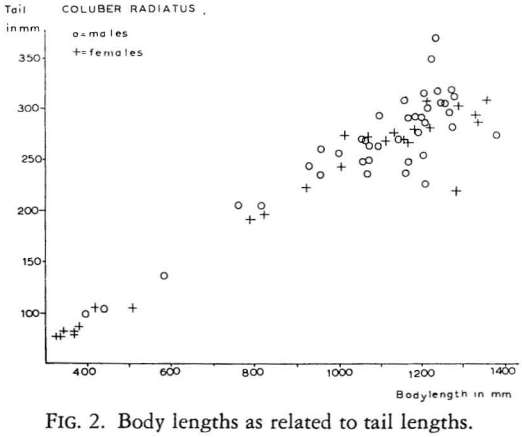

FIG. 2. Body lengths as related to tail lengths.

TABLE 6

Coluber radiatus, NUMBER OF EGGS

BODY LENGTH IN MM.	NUMBER OF EGGS		
	Right	Left	Total
1074	6	3	9
1287	5	2	7
1332	4	3	7
1352	6	—	6
Total n = 4	21	8	29
v. Heurn			8
Kopstein			10
Smith			5
Smith			12
Total n = 8			64

except for the kidneys and the caudal pole of the left ovary, which are situated more caudally in the female. However, to make possible a comparison with other snakes, a table containing the percentile values has been added.

LENGTHS: The lengths of the organs are of the same order in both sexes, except for the gonads: the ovaries are twice as long as the testes. There is some asymmetry: in both sexes the gonads as well as the kidneys are longer on the right side than on the left.

INTERVALS: The intervals between the organs are of the same order in both sexes; in the cranial half of the body they are somewhat greater in the male. In the caudal half the figures are a little higher in the female on the left side. On the right side it is especially B_2, the space between the right gonad and the right kidney, which is greater in females ($D/\sigma_D = 4$). This is due to the fact that the top of the right kidney is more caudally placed in the female (Tables 8, 9). The total amount of free space on both sides is the same in both sexes. However, if we count only the space from the pancreas to the kidney (D_R) on the right side and to that (D_L) on the left side, this region, where the eggs will develop, is greater in females than is the corresponding area in the males, amounting to a difference of about 27 per cent on the right side and 15 per cent on the left.

VARIABILITY: The coefficient of variability (V) is low for all topographical data: it is about 7 in the male series and about 12 in the female.

In the case of the length of the organs, this coefficient is high for the length of the spleen in both sexes and for the length of the gonads

TABLE 7

Coluber radiatus, ♂ ADULTS (> 950 mm.), TOPOGRAPHY

	N	R	M±σm	σ±σσ	V±σv
Body	38	957–1380	1170.0±15.2	94.0±10.8	8.0±0.9
Tail	28	237–351	287.9±4.7	24.6±3.3	8.5±1.1
Heart, top	27	199–264	241.2±2.9	14.8±2.0	6.1±0.8
end	27	231–302	276.8±3.2	16.9±2.3	6.1±0.8
Liver, top	27	286–383	364.3±4.9	25.2±3.4	6.9±0.9
end	27	471–653	580.9±7.2	37.7±5.1	6.5±0.9
Gallbladder, top	27	579–832	708.2±10.1	52.8±7.2	7.5±1.0
end	27	603–859	737.0±10.0	52.3±7.1	7.1±1.0
Pancreas, top	27	604–856	734.2±11.2	58.3±7.9	7.9±1.1
end	27	620–872	751.4±10.2	53.0±7.2	7.1±1.0
Spleen, top	27	601–850	734.2±8.8	53.3±7.2	7.3±1.0
end	27	605–857	737.0±10.2	53.1±7.2	7.2±1.0
Sex R, top	27	688–993	853.6±12.0	62.1±8.5	7.3±1.0
end	27	734–1044	905.3±11.4	59.4±8.1	6.6±0.9
Sex L, top	27	741–1079	931.3±13.1	68.0±9.3	7.3±1.0
end	27	776–1138	975.3±13.3	69.2±9.4	7.1±1.0
Kidney R, top	27	782–1149	990.8±12.9	67.2±9.2	6.8±0.9
end	27	858–1273	1090.9±15.4	80.0±10.9	7.3±1.0
Kidney L, top	27	833–1248	1056.0±14.9	77.4±10.5	7.3±1.0
end	27	917–1331	1150.1±15.6	81.0±11.0	7.1±1.0

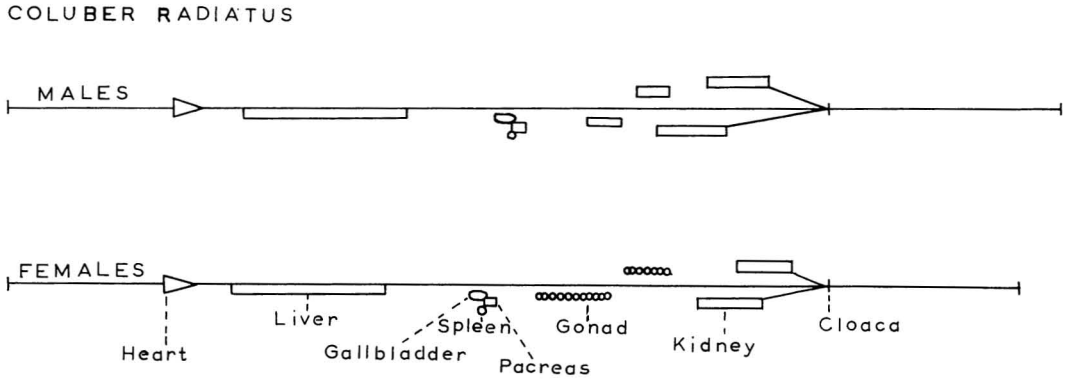

FIG. 3. Topographical pattern of the internal organs in males and females of *Coluber radiatus*.

in the females. For the other organs the range of V is from 10 to 17.

For the intervals the difference seems to be somewhat more marked, the values of V being greater in the female series. However, the small number of females influences the value of σ. Furthermore, the quotient D/σ_D is never higher than 2.5. This figure is found for the variability of C_3 (the distance from the left kidney to the cloaca) in both sexes.

CORRELATIONS: The length of tail has already been discussed above (Table 4). The coefficient of correlation is of the same value in the two sexes. Supporting figures are given in Table 12, both for the symbol r and for its transposition in Z.

The correlation between the length of the body and the weight of the animals seems to be low in the male group. The average weight is of nearly the same value in both sexes. There

TABLE 8

Coluber radiatus, ♀ ADULTS (> 950 mm.), TOPOGRAPHY

	N	R	M±σm	σ±σσ	V±σv
Body	16	989–1325	1175.3±29.0	116.0±20.6	8.4±1.5
Tail	13	247–308	280.4±5.0	17.9±3.5	6.4±1.2
Heart, top	9	195–269	229.5±8.6	28.7±6.8	12.5±2.9
end	9	221–304	263.9±11.5	34.6±8.2	13.1±3.1
Liver, top	9	265–390	324.7±15.0	45.0±10.6	13.8±3.3
end	9	453–653	554.5±23.3	70.0±16.5	12.6±3.0
Gallbladder, top	9	570–765	673.2±25.8	77.1±18.2	11.5±2.7
end	9	596–798	697.7±26.5	79.6±18.8	11.4±2.7
Pancreas, top	9	588–798	695.3±26.6	79.6±18.8	11.5±2.7
end	9	602–816	711.5±27.0	81.4±19.2	11.4±2.7
Spleen, top	9	584–790	689.2±26.4	79.0±18.6	11.5±2.7
end	9	589–798	695.8±26.6	79.6±18.8	11.4±2.7
Ovar. R, top	9	677–902	784.3±25.4	76.1±18.0	9.7±2.3
end	9	738–1023	880.1±33.8	101.5±23.9	11.5±2.7
Ovar. L, top	9	761–1034	902.2±36.0	108.0±25.4	12.0±2.8
end	9	808–1121	977.3±40.0	121.0±28.5	12.4±2.9
Kidney R, top	9	826–1150	1006.4±39.0	117.0±27.6	11.6±2.7
end	9	910–1258	1102.2±43.0	129.0±30.4	11.7±2.8
Kidney L, top	9	874–1186	1063.1±38.6	116.0±27.3	10.9±2.6
end	9	950–1272	1147.2±43.8	131.5±31.0	11.4±2.7

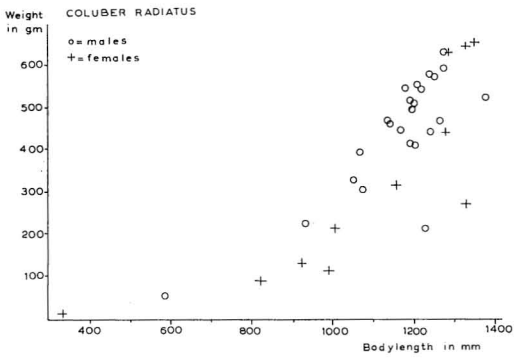

FIG. 4. Relationships between length and weight in males and females.

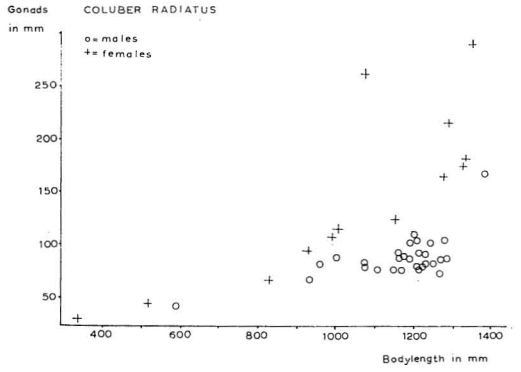

FIG. 5. Length of gonads as related to body length and sex.

TABLE 9

TOPOGRAPHY OF *Coluber radiatus* IN ‰ OF THE BODY LENGTH

♂ ADULTS N = 27		♀ ADULTS N = 9	FEMALES, THE FOLLOWING ORGANS SHIFT IN ‰	
Body length M = 1196		Body length M = 1200	Cranially	Caudally
	‰	‰		
Body length	1000	1000		
Tail*	245	234		
Heart, top	202	191	11	
end	232	220	12	
length	30	29		
Liver, top	287	271	16	
end	485	462	23	
length	198	192		
Gallbladder, top	592	561	31	
end	616	582	34	
length	24	22		
Pancreas, top	614	580	34	
end	629	593	36	
length	15	13		
Spleen, top	610	575	35	
end	616	580	36	
length	6	5		
Sex R, top	704	645	71	
end	743	733	25	
length	40	89		
Sex L, top	766	752	23	4
end	803	815		
length	35	63		
Both	74	152		
Kidney R, top	791	840		49
end	876	919		43
length	85	79		
Kidney L, top	850	886		36
end	922	955		33
length	73	69		
Both	157	149		

* Data from the table of correlations.

TABLE 10

Coluber radiatus, ADULTS, LENGTH OF THE ORGANS

	N	R	M±σm	σ±σσ	V±σv
Males > 950 mm.					
body	38	957–1380	1170.0±15.2	94.0±10.8	8.0±0.9
tail	28	237–351	287.9±4.7	24.6±3.3	8.5±1.1
heart	27	30–45	36.0±0.8	4.2±0.6	11.7±1.6
liver	27	185–291	236.8±3.9	20.2±2.7	8.5±1.2
gallbladder	27	22–42	29.4±1.0	5.2±0.7	17.6±2.4
pancreas	27	12–27	18.9±0.6	3.3±0.4	17.5±2.4
spleen	27	4–12	6.9±0.4	2.3±0.3	33.0±4.5
sex R	27	41–61	47.7±1.1	6.1±0.8	12.7±1.7
sex L	27	30–59	41.2±1.4	6.6±0.9	16.0±2.2
sex both	27	76–110	88.8±2.3	11.0±1.5	12.4±1.7
kidney R	27	76–134	105.7±2.9	14.9±2.0	14.1±1.9
kidney L	27	64–112	89.8±2.0	10.4±1.4	11.7±1.6
both kidneys	27	150–232	197.0±1.2	20.2±2.7	10.2±1.4
Females > 959 mm.					
body	16	989–1352	1178.5±29.0	116.0±20.5	8.4±1.5
tail	13	247–308	280.4±5.0	17.9±3.2	6.4±1.3
heart	9	25–41	34.5±1.7	5.2±1.2	15.1±3.6
liver	9	184–287	230.7±11.3	33.1±7.8	14.3±3.4
gallbladder	9	19–33	26.5±1.7	5.0±1.2	19.5±4.6
pancreas	9	12–22	16.2±1.1	3.2±0.8	19.8±4.7
spleen	9	4–9	6.5±0.6	1.7±0.4	26.2±6.2
ovar. R	9	61–174	106.9±13.2	39.6±9.3	37.0±8.7
ovar. L	9	47–117	75.0±8.2	24.6±5.8	32.8±7.7
ovar. both	9	108–291	182.0±23.4	70.0±16.5	38.6±9.1
kidney R	9	71–126	95.7±4.9	16.3±3.9	17.0±4.1
kidney L	9	70–96	83.2±3.0	9.1±2.1	10.9±2.6
both kidneys	9	141–216	178.9±7.9	23.8±5.6	13.3±3.1

TABLE 11

Coluber radiatus, MALE ADULTS, INTERVALS BETWEEN THE ORGANS

	N	R	M±σm	σ±σσ	V±σv
A1 snout–heart	27	199–264	241.2±2.9	14.8±2.0	6.1±0.8
A2 heart–liver	27	43–87	66.3±2.1	11.0±1.5	16.6±2.5
A3 liver–gallbladder	27	95–179	127.3±3.8	19.8±2.7	15.5±2.6
A	27	362–506	435.–±7.5	39.–±5.3	9.–±1.2
B1 pancreas–gonad	27	68–141	101.5±2.7	14.–±1.9	13.9±1.8
B2 gonad R–kidney R	26	38–125	85.6±4.2	20.7±2.8	24.2±3.4
B3 kidney R–cloaca	26	77–120	102.7±2.2	11.–±1.5	10.7±1.5
B	26	215–333	289.2±4.9	25.0±3.5	8.6±1.2
C1 pancreas–gonad L	27	121–208	182.0±3.5	18.–±2.4	9.9±1.4
C2 gonad L–kidney L	26	48–113	82.6±3.4	17.3±2.4	21.2±2.8
C3 kidney L–cloaca	26	39–59	47.6±1.1	5.4±0.8	11.4±1.6
C	26	218–366	311.5±5.8	30.–±4.2	9.6±1.3
A+B	26	577–839	724.3±10.8	55.–±7.6	7.6±1.–
A+C	26	580–872	742.8±12.1	60.9±8.5	8.2±1.1
D_R pancreas–kidney R	26	162–284	232.9±4.7	24.7±3.3	10.6±1.5
D_L pancreas–kidney L	26	213–376	305.5±5.5	30.6±4.3	10.–±1.4

TABLE 12

Coluber radiatus, FEMALE ADULTS, INTERVALS BETWEEN THE ORGANS

	N	R	M±σm	σ±σσ	V±σv
A1 snout–heart	9	195–269	229.5±8.6	28.7±6.8	12.5±2.9
A2 heart–liver	9	36–90	60.8±5.5	16.4±3.9	27.–±5.6
A3 liver–gallbladder	9	60–161	118.4±9.3	27.9±6.6	23.6±5.6
A	9	302–516	398.7±6.3	18.6±4.4	4.7±1.1
B1 pancreas–ovar	9	29–86	62.7±5.8	17.7±4.2	28.2±6.6
B2 gonad R–kidney	9	88–166	126.3±8.7	26.–±6.1	20.6±4.9
B3 kidney R–cloaca	9	73–117	73.8±3.6	10.9±2.6	14.8±3.5
B	9	227–334	28.6±4.1	12.2±2.9	4.3±1.0
C1 pancreas–ovar	9	147–250	190.7±10.8	32.5±2.9	17.1±4.–
C2 ovar. L–kidney L	9	51–118	85.7±6.6	19.9±4.7	23.2±5.5
C3 kidney L–cloaca	9	39–84	53.–±4.8	13.7±3.2	25.6±6.0
C	9	255–409	330.2±17.2	45.5±10.7	13.7±3.2
A+B	9	534–831	694.7±30.7	29.1±6.8	4.9±1.2
A+C	9	592–861	739.–±29.–	27.6±6.5	3.7±0.9
D_R pancreas–kidney R	9	215–365	295.–±14.–	41.8±9.9	14.5±3.4
D_L pancreas–kidney L	9	263–418	351.3±16.–	48.3±11.4	13.8±3.3

TABLE 13

Coluber radiatus, CORRELATIONS

	N	R	M±σm	σ	V
FEMALES					
Body length	6	1006–1352	1200.3±64.0	143.0	11.9
Tail length	6	247–308	280.0±10.2	22.9	8.2
		r = 0.750	Z = 0.96±0.58		
Body length	8	989–1352	1216 ±55.6	148.–	12.2
Weight	8	118–658	426 ±78	206.–	48.5
		u = 0.810	Z = 1.14±0.45		
Body length	9	989–1352	1200.0±51.0	144.–	12.0
Gonads	9	108–291	182.0±22.8	64.5	35.4
		r = 0.740	Z = 0.95±0.41		
Body length	9	989–1352	1200.0±51.0	144.0	12.0
Kidneys	9	141–216	179.0± 8.8	24.8	13.9
		r = 0.750	Z = 0.96±0.41		
MALES					
Body length	29	957–1285	1158.7±18.1	97.6±12.8	8.4±1.1
Tail length	29	237–350	287.4± 4.6	24.7± 3.2	8.6±1.1
		r = 0.760	Z = 1.00±0.20		
Body length	22	1061–1380	1210.6±15.5	72.8±11.0	6.0±0.9
Weight	22	217–635	477.8±21.7	101.7±15.3	21.2±3.2
		r = 0.508	Z = 0.57±0.23		
Body length	27	957–1380	1192.2±15.4	80.0±10.9	6.7±0.9
Gonads	27	76–110	88.8± 1.9	9.9± 1.4	11.1±1.5
		r = 0.410	Z = 0.44±0.20		
Body length	29	957–1380	1201.0±18.3	93.1±12.9	7.6±1.0
Kidneys	26	150–232	196.5± 4.1	20.8± 2.9	10.6±1.5
		r = 0.780	Z = 1.06±0.28		

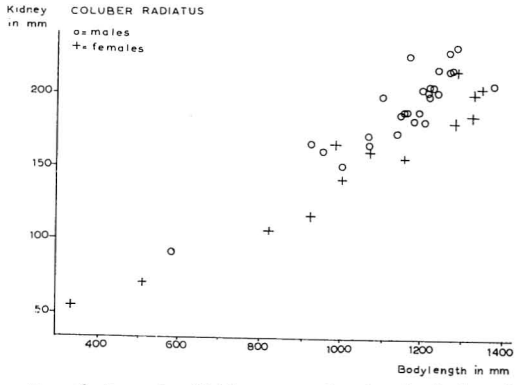

FIG. 6. Length of kidneys as related to body length and sex.

is no sexual dimorphism in this respect.

The coefficient of variation for the length of the gonads is much higher in the small group of females than in the male group; the coefficient of correlation r is lower in the latter.

For the length of the body and that of the kidneys, the values of the coefficients of correlation r are of the same order for both sexes.

Coluber melanurus

Coluber melanurus appears to be widespread (de Rooy, 1916). However, in the vicinity of Surabaia and Djakarta on the north coast of Java this snake is very seldom found: we collected only four of these animals, three males, one female.

Melanurus means "with a black tail." In our specimens not only the black tail is very conspicuous, but the black markings on the sides in the cranial half of the body and the black streaks behind the eye cannot be overlooked.

The maximum size, according to de Rooy, is 1400 + 400 mm. Smith gives 1200 + 360 mm. for a male (*Elaphe flavolineata*). Our specimens are much smaller: they range from 387 to 481 mm. in body length. This would suggest that they are young animals. The female is the shorter one. However, the number of observations is too small to be of any use when the question is put whether or not there is a sexual dimorphism in body length. The length of the tail (in ‰ of the body length) is 242-242-269 in our male animals, and in our female specimen it is 238. So there does not seem to be a sexual dimorphism in this character.

In one of the males, (400 mm. in length), a worm was protruding through the skin, about at the level of the top of the right testis.

TOPOGRAPHY: The measurements and their values (expressed in permillage of the length of the body) are given in Table 14.

In our young female the heart and the liver are placed somewhat more caudally than in the males, which is an unusual though not wholly improbable situation. Another exceptional measurement is that the top of the right kidney is also placed more cranially in this female than in the males. Table 14 shows the relevant figures in brackets. Perhaps an error in recording the data has been made here. Indeed, one would expect the top of the right kidneys in a female animal to be placed a little caudally from the same spot in the male, or perhaps at the same level, but hardly more cranially. Furthermore, as the figures are studied, the length of the right

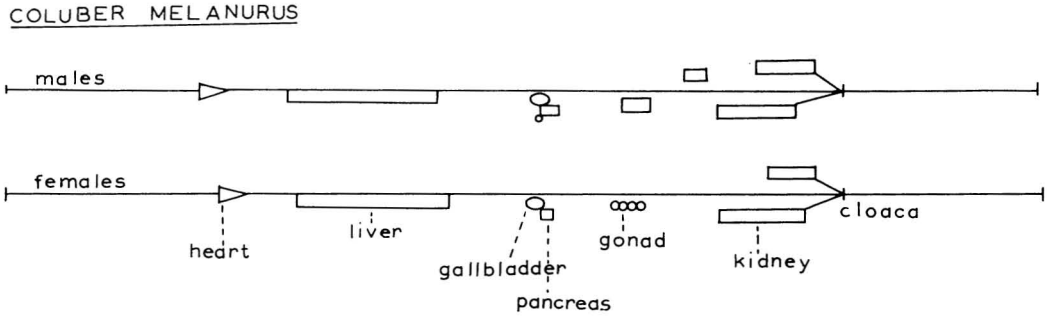

FIG. 7. Topographical pattern of the internal organs in males and a female of *Coluber melanurus*.

kidney seems to be rather long in this female—55 mm.—whereas one would expect it to be about 93 ‰ of the body length, or about 36 mm. If the kidney had really been so much longer than usual, I would certainly have added a memorandum to that effect. If we accept the smaller figure (36 mm.) for the end of the kidney as the correct one, because we find it to correspond with the expected value, this correction would place the top at 331 mm. from the snout instead of at 313, as was recorded. This is probably to be explained as a simple transposition of the figures. Unfortunately the material is no longer available and cannot be checked.

LENGTH OF THE ORGANS: The only difference found between the sexes is the length of the kidneys, and as explained, this is probably a mistake. If we accept the rectification, the length of both kidneys in the female is 64 mm. or, in

TABLE 14

Coluber melanurus

TOPOGRAPHY	MALES						FEMALES			
	Absolute values						‰		Absolute value	‰
	2110		5795	3021	M				5210	
Body	400		429	481	437		1000		387	1000
Tail	97		95	129		107	230		92	238
Heart, top	97		91	113	100		230		99	256
end	112		115	126	117		270		108	256
length		15	24	13		17		40	9	23
Liver, top	134		145	161	147		336		135	349
end	205		216	251	224		513		205	530
length		71	71	90		77		177	70	181
Gallbladder, top	251		268	305	272		629		241	623
end	262		278	311	283		650		249	638
length		11	10	6		9		21	8	21
Pancreas, top	260		272	310	281		643		247	638
end	268		279	318	288		661		253	654
length		8	7	8		7		18	6	16
Spleen, top	258		271	308	279		639		—	—
end	260		273	311	281		643		—	—
length		2	2	3		2		5	—	—
Testes R, top	296		314	355	322		736		281	726
end	311		327	371	336		769		295	762
length		15	13	16		14		34	14	36
Testes L, top	324		344	391	353		809		—	—
end	338		357	402	366		838		—	—
length		14	13	11		13		29	—	—
both		29	26	27		27		63	—	—
Kidney R, top	335		369	410	371		851		[313]	[810]
end	370		408	458	412		944		368	951
length		35	39	48		41		93	[55]	[141]
Kidney L, top	358		385	428	390		895		349	903
end	386		415	465	422		966		375	970
length		28	30	37		32		72	26	67
both		63	69	85		72		165	81	208
Weight	12		14	24	17		38		22	57
Lung, top			108						107	276
opening			—						—	—
trachea			—						111	287
trabecula			154						147	380
end			—						347	896

TABLE 15

Coluber melanurus, SHIELDS

SEX	VENTRALS	SUBCAUDALS	ROWS
♂ Djak	228	88	19–19–17
de Rooy	193–234	89–115	19
Smith	193–234	85–115	19–19–17
♀ Djak	226	86	19–19–17

‰ of the body length, 165 exactly as in the males.

There is little or no asymmetry in the length of the right and left testes, but in males the right kidney is about one-fourth longer than the left one.

INTERVALS: The interval between the pancreas and the left kidney is 234 ‰ of the body length in the male animals, 248 ‰ in the female.

LUNG: In these two young animals there is no difference in the topography of the lung: in the male the apex is at 270 ‰, in the female at 276 ‰; the end of the trabecular part of the lung is at 384 ‰, resp 380 ‰ of the body length. In the female only, the end has been noted rather far to the caudal end of the body (896 ‰).

SHIELDS: In one male and in the female the number of shields is counted: the figures are given in Table 15. There is no difference between the sexes.

REFERENCES

HEURN, W. C. VAN. 1929. *Coluber radiatus*, de tjaoe asak. Trop. Natuur. Pp. 128–130.

KOPSTEIN, F. 1941. Sexual Dimorphismus bei Malaiischen Schlangen. Temminckia 6.

RADSMA, W. 1948. Inleiding tot de physiologische chemie. J. B. Wolters ed. Groningen-Batavia. Pp. 152.

ROOY, N. DE. 1916. Catalogue of the reptiles of the Indo-Australian archipelago. Leiden. Vol. II, Brill ed.

SIMPSON, G. G., and A. ROE. 1939. Quantitative Zoology. McGraw Hill Co., New York.

SMITH, M. H. 1943. The Fauna of British India, Ceylon and Burma. London. Vol. 3: Serpentes.

SCHLEGEL. 1837. Phys. Serpent. Pp. 135.